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Synostemon hamersleyensis (Phyllanthaceae), a new species endemic to the Pilbara, Western Australia

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Abstract

Telford, I.R.H. & Naaykens, J. *Synostemon hamersleyensis* (Phyllanthaceae), a new species endemic to the Pilbara, Western Australia. *Nuytsia* 25: 31–37. *Synostemon hamersleyensis* I.Telford & Naaykens (Phyllanthaceae), morphologically similar to but distinct from *Sauropus aphyllus* J.T.Hunter & J.J.Bruhl, is named as new and its habitat, distribution and conservation status are discussed. The new species is endemic to ironstone formations of the Hamersley Range in the Pilbara, central Western Australia.

Introduction

The genus *Synostemon* F.Muell. was described by Mueller (1858) to accommodate his new species, *S. ramosissimus* F.Muell. and *S. glaucus* F.Muell., the former nominated as lectotype of the genus by Wheeler (1975). The genus was promptly reduced to sectional rank in *Phyllanthus* L. by Müller (1865), resurrected at generic rank by Airy Shaw (1969), to be later subsumed into *Sauropus* Blume (Airy Shaw 1980).

Generic delimitation in Phyllanthaceae tribe Phyllantheae Dumont remains contentious. Using molecular data Kathriarachchi *et al.* (2006) showed *Sauropus* (including *Synostemon*), *Breynia* J.R.Forst. & G.Forst. and *Glochidion* J.R.Forst. & G.Forst. to be embedded in a paraphyletic *Phyllanthus* and the authors proposed adopting a giant *Phyllanthus* subsuming these other genera. A revised classification of the family has been published (Hoffman *et al.* 2006), with *Sauropus*, *Glochidion*, *Breynia* and *Reverchonia* A.Gray included under *Phyllanthus*. Van Welzen *et al.* (2014) have presented an alternative hypothesis based on molecular analysis using denser sampling (Pruesapan *et al.* 2008, 2012) with on-going research that points to dismantling *Phyllanthus* into monophyletic and morphologically recognisable smaller genera. As a revised classification of tribe Phyllantheae based on a soundly sampled phylogeny is some considerable time away, *Synostemon* is treated here at generic rank.

The Australian Plant Census website (Council of Heads of Australasian Herbaria 2007–) currently lists 27 named species of *Sauropus* following Hunter and Bruhl (1997a, 1997b, 1997c) that fall within the circumscription of *Synostemon* (Pruesapan *et al.* 2008, 2012; I. Telford unpublished data). An additional ten putative new species have been segregated on morphological evidence (I. Telford, unpublished

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data); several of these novelties have been tested and corroborated as distinct by phylogenetic analysis using sequence data (Pruesapan *et al.* 2008, 2012).

Most species of *Synostemon* are microphyllous. Extreme branchlet leaf reduction to cataphylls is shown by a narrowly endemic species in north-eastern Queensland at present treated as *Sauropus aphyllus* J.T.Hunter & J.J.Bruhl (Hunter & Bruhl 1997a). In 2004, a plant resembling this species was collected during a vegetation survey in the Pilbara some 2,800 km distant from the range of *S. aphyllus*. The collection was recognised as a new taxon and given the phrase name *Sauropus* sp. Koodaideri detritals (J. Naaykens & J. Hurter JH 11213).

Following the discovery of this species, a detailed study of the area where it was first detected was conducted by Rio Tinto botanists. A full assessment of habitat preferences combined with a thorough knowledge of the surrounding region identified a number of target areas in which to search for additional populations. As populations lay within a mining lease held by Rio Tinto Iron Ore (RTIO), identification of the species and assessment of its conservation status were priorities.

Methods

The taxonomic component of this study is based on observations of herbarium specimens held in PERTH and NE. Floral attributes were measured following rehydration. To assess population sizes, targeted surveys were conducted to record observed individuals and estimate plant numbers; voucher specimens were lodged in PERTH.

Results and Discussion

Comparison of vegetative, floral and fruit morphology show co-varying discontinuities between the Pilbara collections and *Sauropus aphyllus* (Table 1). Preliminary phylogenetic analysis using nrITS (nuclear ribosomal Internal Transcribed Spacer) sequence data (I. Telford, unpublished data) places the two species together in clade B1 of Pruesapan *et al.* (2012, see Figure 1). The Pilbara populations must be regarded as constituting a new species, which is named below.

Taxonomy

Synostemon hamersleyensis I.Telford & Naaykens, *sp. nov.*

Type: north-west of Newman, Western Australia [precise locality withheld for conservation reasons], 7 November 2012, *J. Naaykens* J969 - 11 - 12 (*holo*: PERTH 08423032; *iso*: CANB, L, NE).

Sauropus sp. Koodaideri detritals (J. Naaykens & J. Hurter JH 11213), Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed 15 August 2014].

Glabrous monoecious or dioecious *subshrub* from a perennating, woody rootstock with stems much-branched, to 50 cm high, bright green when fresh, becoming grey-green on drying with cuticular wax shed in flakes. *Stipules* ±appressed, broadly triangular to ovate, 0.3–0.4 mm long, obtuse, brown with paler lacerate margins. *Stem leaves* cataphylls (scale-like), triangular, 0.3–0.5 mm long, acute, brown. Ultimate branchlets 25–90 mm long, ribbed, 0.4–0.7 mm diam., glutinous. *Branchlet leaves* cataphylls, appressed to spreading, broadly triangular, 0.3–0.7 mm long, acute, brown. *Male flowers* in 1–3 bracteate fascicles per axil, becoming racemose with peduncles to 2 mm long, of several

flowers with 1 flower at anthesis at one time; *pedicels c.* 0.5–0.8 mm long; *tepals* 6 in 2 whorls, spreading, ovate or elliptic, 1.3–1.5 mm long, *c.* 0.8 mm wide, purple with white margins; *stamens* 3, erect; *filaments* connate, *c.* 0.4 mm long; *anthers* longitudinal, elliptic, *c.* 0.3 mm long, fused only at their bases. *Female flowers* solitary; *pedicels* 0.4–0.6 mm long; *tepals* 6 in 2 whorls, spreading, ovate, 0.6–0.7 mm long, *c.* 0.5 mm wide, obtuse, yellow and red-brown, the margins white; *ovary* subglobose, *c.* 0.3 mm diam., glabrous; *stigmas c.* 0.25 mm long, divergent, bifid for *c.* half their length, the branches curved. *Fruit* a broadly ovoid or subglobose schizocarp 3.6–4.2 mm long, *c.* 3.5 mm diam., smooth, green. *Seeds* crescentiform, triquetrous, 3.4–3.7 mm long, *c.* 2.3 mm wide, *c.* 1.2 mm deep, verruculose in longitudinal rows, pale brown with the apices of the warts white; *hilum* ovate, 0.5–0.7 mm long, *c.* 0.55 mm wide. (Figure 1)

Diagnostic features. *Synostemon hamersleyensis* is distinguished from *Sauropus aphyllus* by a combination of its smaller stipules and cataphylls, larger male flowers with purple and white sepals, and smaller female flowers (Table 1); both differ from all other known *Synostemon* species in their branchlet leaves being cataphylls.

Selected specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 7 July 2010, *P. Hoffman* BES PH 214 (NE, PERTH); 8 Nov. 2012, *J. Naaykens* J981 - 11 - 12, male flowers (CANB, L, NE, PERTH).

Distribution. The species is restricted to the Hamersley subregion of the Pilbara bioregion of Western Australia (Department of the Environment 2013), where it is known from a 30 × 5 km area of the mid- to upper altitude zone of the northern edge of the Hamersley Range (Figure 2). At present *S. hamersleyensis* has not been found in Karijini National Park to the west of the current populations. Surveys in this area are severely hindered by lack of access and it is yet to be comprehensively explored.

Habitat. *Synostemon hamersleyensis* inhabits breakaway formations and rock outcrops either side of incised gully systems (Figure 1A) and upper slopes (7–30° slope) on wide, undulating ridges adjacent to large, deeply incised gullies. Occurs most commonly at altitudes of (500–)550–650(–700) m asl. The substrates may be broadly categorised as belonging to the Joffre Member of the Brockman Iron Formation (banded ironstone), within vegetation typically dominated by *Eucalyptus leucophloia* and lacking a significant *Triodia* component (Figure 1A).

This community consists of scattered trees to low open woodland of *Eucalyptus leucophloia* and *E. gamophylla* with scattered shrubs of *Senna glutinosa* subsp. *glutinosa*, *Grevillea wickhamii*, *Acacia arida*, *A. spondylophylla*, *Gompholobium oreophilum*, *Dampiera candicans* and *Stylobasium spathulatum* over *Triodia wiseana* open hummock grassland. The species has also been recorded from *Eucalyptus victrix* woodland over *Acacia colei*, *A. hamersleyensis*, *Gossypium robinsonii*, *Corchorus lasiocarpus*, *Sida* sp. Barlee Range (S. van Leeuwen 1520) and *Cymbopogon ambiguus*. It appears unusual for *S. hamersleyensis* to be associated with *E. victrix* as this occurs lower in the range system, rather than in upland incised gullies, or on larger drainage systems confined to the flatter valley formations.

Phenology. Flowering and fruiting appear to be most prevalent in spring; however, observations have been limited to August 2011, October 2011 and November 2012. Those who first collected this species indicated that no reproductive material was present in the May–June period of 2010. Observation in August of fruit and flowers suggested female dominance with only the occasional male flower, similarly during October, and with male and female flowers and fruit relatively abundant in November.

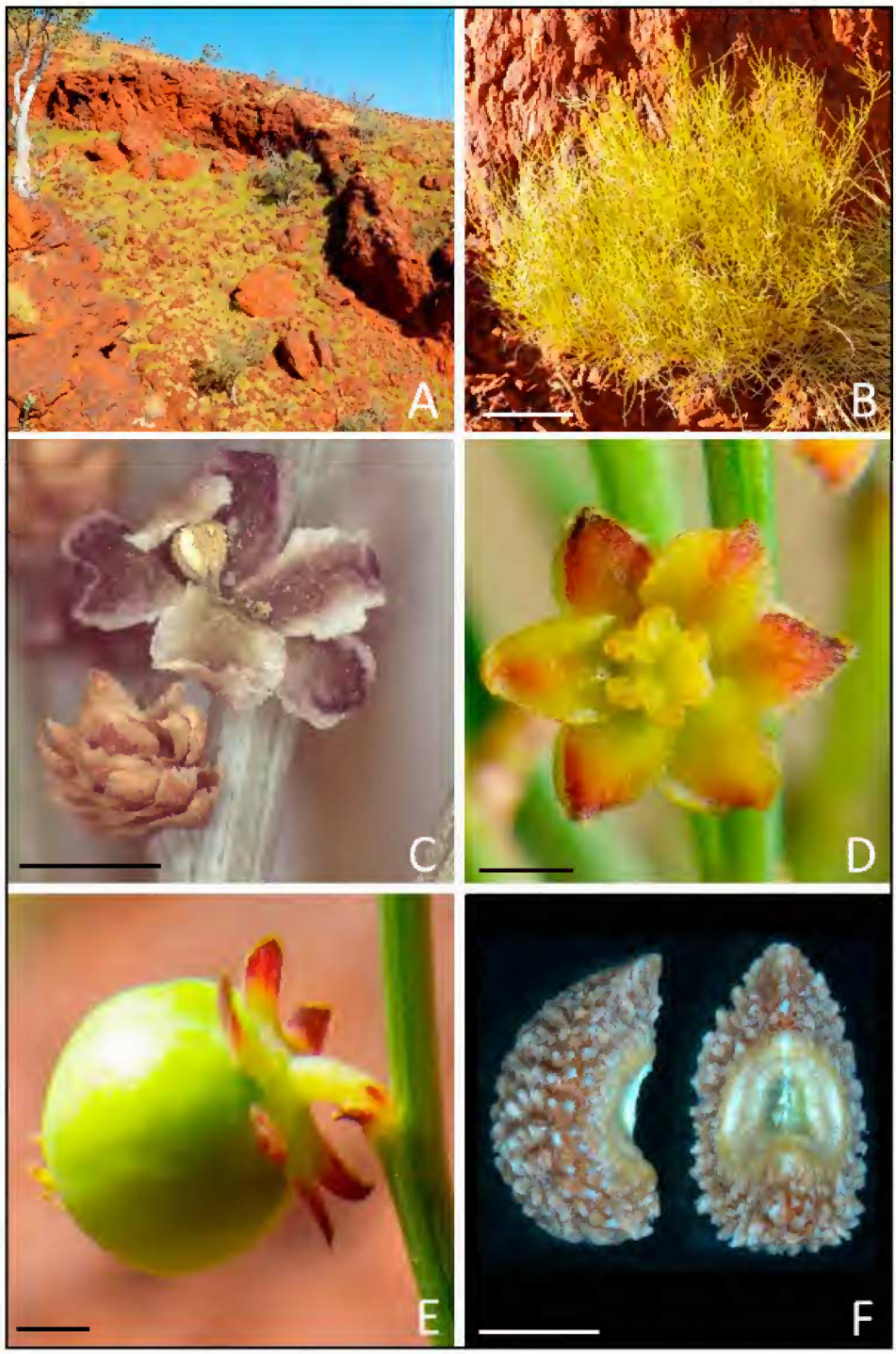

Figure 1. *Synostemon hamersleyensis*. A – habitat; B – habit; C – male flower (from dried specimen); D – female flower; E – fruit; F – seeds. Scale bars = 10 cm (B); 1 mm (C, D, E, F). Images from *J. Naaykens* 981 - 11 - 12 (C) and *J. Naaykens* 969 - 11 - 12 (D, E, F). Photographs by J. Naaykens (A, B, D, E) and J.J. Bruhl (C, F).

Table 1. Distinguishing morphological attributes of *Synostemon hamersleyensis* and *Sauropus aphyllus*.

Character	*Synostemon hamersleyensis*	*Sauropus aphyllus*
Stipule shape	broadly triangular to ovate	narrowly triangular
Stipule length (mm)	0.3–0.4	0.4–1
Branchlet cataphyll length (mm)	0.3–0.8	0.7–1.2
Male inflorescences per axil	1–3	1
Male sepal length (mm)	1.3–1.5	0.8–1.3
Male sepal colour	purple, white margin	white, tinged red
Female sepal length (mm)	0.4–0.6	0.9–1.8
Female sepal colour	red-brown and yellow	white, tinged red

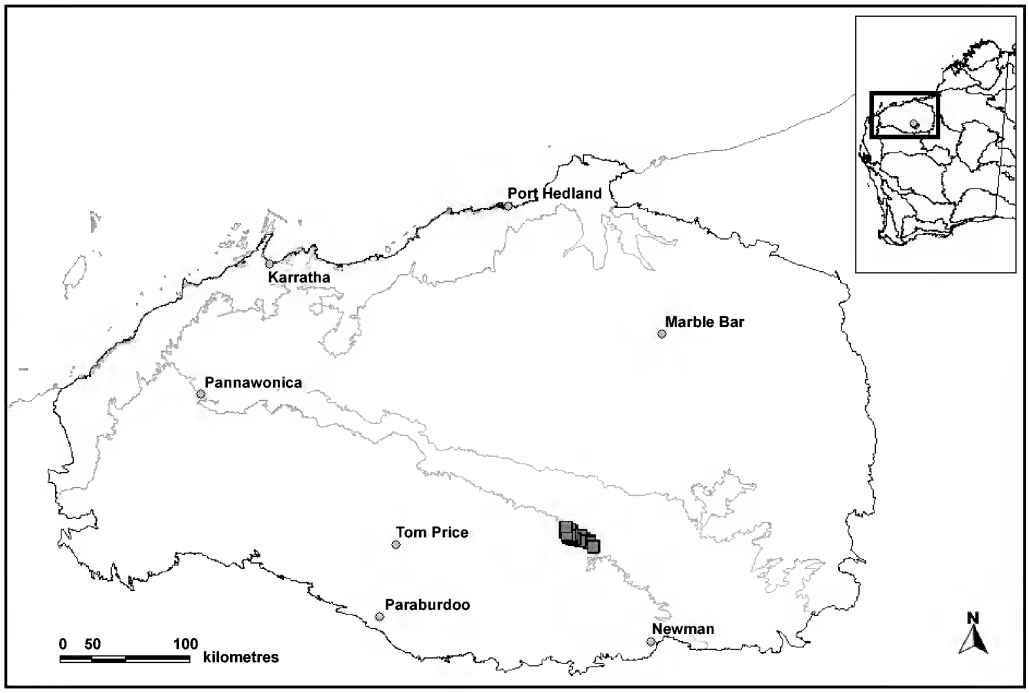

Figure 2. Distribution of *Synostemon hamersleyensis* (■) in the Pilbara, Western Australia.

Etymology. This epithet refers to the Hamersley Range, to which the species is restricted. This mountainous area of Proterozoic sedimentary ranges and plateaux dissected by gorges is the jewel in the Pilbara crown of landforms. Highly significant within the arid lands of Western Australia, the Hamersley Range provides unique biological habitats and refugia, and consequently is an important zone of endemism and biodiversity (Pepper *et al*. 2008).

Conservation status. *Synostemon hamersleyensis* is listed by Jones (2014) as Priority One under Department of Parks and Wildlife Conservation Codes for Western Australian Flora, as *Sauropus* sp. Koodaideri detritals (J. Naaykens & J. Hurter JH 11213). All of its known populations occur on mining leases and it has not been collected from nearby Karijini National Park. To date, targeted surveys of *c*. 998 ha of suitable habitat have recorded 4,341 individuals; however, an additional *c*. 9,000 ha

of potentially suitable habitat has been identified within the current known range of this species. Immediate further survey is required to obtain true estimates of its distribution and population sizes to determine whether the current conservation status of *S. hamersleyensis* is appropriate, or whether it requires downgrading, or listing as Threatened.

Many of the upland gullies with *Triodia* open hummock grasslands in which *Synostemon hamersleyensis* occurs are somewhat fire-protected; elsewhere it is restricted to rocky zones and positions with low cover of *Triodia*, such as under old *Eucalyptus leucophloia* trees, which are protected from grass-facilitated fire. These low-fire habitats, together with the species' capability of resprouting from perennating rootstocks after severe fires, should ensure its survival, at least after infrequent burning.

Affinities. A close relationship between *Synostemon hamersleyensis* and *Sauropus aphyllus* is suggested by their similar morphologies, particularly in seed features (Table 1). This is corroborated by preliminary phylogenetic analysis using nrITS sequence data which places the two species together in a clade (I. Telford, unpublished data).

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